

Application No.: 10/761,101

Response dated: November 14, 2005

Reply to Office Action: September 16, 2005

### **IN THE SPECIFICATION**

#### **Please amend the Specification as follows:**

*At column 3, lines 55 to 62 please replace the paragraph with the following:*

R<sup>1</sup> and R<sup>2</sup> are independently a C<sub>1</sub> to C<sub>20</sub> hydrocarbon group, a heteroatom containing group having up to twenty carbon atoms, silicon, germanium, tin, lead, or phosphorus, preferably a C<sub>2</sub> to C<sub>20</sub> alkyl, aryl or [aralkyl] arylakyl group, more preferably a linear, branched or cyclic C<sub>2</sub> to C<sub>20</sub> alkyl group, most preferably a C<sub>2</sub> to C<sub>6</sub> hydrocarbon group.

*At column 4, lines 1-10, please replace the paragraph with the following:*

R<sup>4</sup> and R<sup>5</sup> are independently an alkyl group, an aryl group, substituted aryl group, a cyclic alkyl group, a substituted cyclic alkyl group, a cyclic [aralkyl] arylakyl group, a substituted cyclic [aralkyl] arylakyl group or multiple ring system, preferably having up to 20 carbon atoms, more preferably between 3 and 10 carbon atoms, and even more preferably a C<sub>1</sub> to C<sub>20</sub> hydrocarbon group, a C<sub>1</sub> to C<sub>20</sub> aryl group or a C<sub>1</sub> to C<sub>20</sub> [aralkyl] arylakyl group, or a heteroatom containing group, for example PR<sub>3</sub>, where R is an alkyl group.

*At column 4, lines 28-37, please replace the paragraph with the following:*

An alkyl group may be a linear, branched alkyl radicals, or alkenyl radicals, alkynyl radicals, cycloalkyl radicals or aryl radicals, acyl radicals, aroyl radicals, alkoxy radicals, aryloxy radicals, alkylthio radicals, dialkylamino radicals, alkoxycarbonyl radicals, aryloxycarbonyl radicals, carbomoyl radicals, alkyl- or dialkyl- carbamoyl radicals, acyloxy radicals, acylamino radicals, aroylamino radicals, straight, branched or cyclic,

alkylene radicals, or combination thereof. An [aralkyl] arylakyl group is defined to be a substituted aryl group.

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*At column 6, line 47 carried over to column 8, line 2 please delete the paragraphs and insert the following paragraphs:*

In one embodiment, the bulky ligand metallocene-type catalyst compounds are represented by the formula:



where  $[M] \underline{M}'$  is a metal atom from the Periodic Table of the Elements and may be a Group 3 to 12 metal or from the lanthanide or actinide series of the Periodic Table of Elements, preferably  $[M] \underline{M}'$  is a Group 4, 5 or 6 transition metal, more preferably  $[M] \underline{M}'$  is a Group 4 transition metal, even more preferably  $[M] \underline{M}'$  is zirconium, hafnium or titanium. The bulky ligands,  $L^A$  and  $L^B$ , are open, acyclic or fused ring(s) or ring system(s) and are any ancillary ligand system, including unsubstituted or substituted, cyclopentadienyl ligands or cyclopentadienyl-type ligands, heteroatom substituted and/or heteroatom containing cyclopentadienyl-type ligands. Non-limiting examples of bulky ligands include cyclopentadienyl ligands, cyclopentaphenanthrenyl ligands, indenyl ligands, benzindenyl ligands, fluorenyl ligands, octahydrofluorenyl ligands, cyclooctatetraendiyl ligands, cyclopentacyclododecene ligands, azenyl ligands, azulene ligands, pentalene ligands, phosphoyl ligands, phosphinimine (WO 99/40125), pyrrolyl ligands, pyrazolyl ligands, carbazolyl ligands, borabenzene ligands and the like, including hydrogenated versions thereof, for example tetrahydroindenyl ligands. In one embodiment,  $L^A$  and  $L^B$  may be any other ligand structure capable of  $\eta$ -bonding to  $[M] \underline{M}'$ , preferably  $\eta^3$ -bonding to  $[M] \underline{M}'$  and most preferably  $\eta^5$ -bonding. In yet another embodiment, the atomic molecular weight (MW) of  $L^A$  or  $L^B$  exceeds 60 a.m.u., preferably greater than 65 a.m.u.. In another embodiment,  $L^A$  and  $L^B$  may comprise one or more heteroatoms, for example, nitrogen, silicon, boron, germanium, sulfur and phosphorous, in combination with carbon atoms to form an open, acyclic, or preferably a fused, ring or ring system, for example, a hetero-cyclopentadienyl ancillary ligand. Other  $L^A$  and  $L^B$  bulky ligands include but are not limited to bulky amides, phosphides,

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alkoxides, aryloxides, imides, carbolides, borollides, porphyrins, phthalocyanines, corrins and other polyazomacrocycles. Independently, each  $L^A$  and  $L^B$  may be the same or different type of bulky ligand that is bonded to  $[M] \underline{M}'$ . In one embodiment of formula (III) only one of either  $L^A$  or  $L^B$  is present.

Independently, each  $L^A$  and  $L^B$  may be unsubstituted or substituted with a combination of substituent groups R. Non-limiting examples of substituent groups R include one or more from the group selected from hydrogen, or linear, branched alkyl radicals, or alkenyl radicals, alkynyl radicals, cycloalkyl radicals or aryl radicals, acyl radicals, aroyl radicals, alkoxy radicals, aryloxy radicals, alkylthio radicals, dialkylamino radicals, alkoxycarbonyl radicals, aryloxycarbonyl radicals, carbomoyl radicals, alkyl- or dialkyl- carbamoyl radicals, acyloxy radicals, acylamino radicals, aroylamino radicals, straight, branched or cyclic, alkylene radicals, or combination thereof. In a preferred embodiment, substituent groups R have up to 50 non-hydrogen atoms, preferably from 1 to 30 carbon, that can also be substituted with halogens or heteroatoms or the like. Non-limiting examples of alkyl substituents R include methyl, ethyl, propyl, butyl, pentyl, hexyl, cyclopentyl, cyclohexyl, benzyl or phenyl groups and the like, including all their isomers, for example tertiary butyl, isopropyl, and the like. Other hydrocarbyl radicals include fluoromethyl, fluoroethyl, difluoroethyl, iodopropyl, bromohexyl, chlorobenzyl and hydrocarbyl substituted organometalloid radicals including trimethylsilyl, trimethylgermyl, methyldiethylsilyl and the like; and halocarbyl-substituted organometalloid radicals including tris(trifluoromethyl)-silyl, methyl-bis(difluoromethyl)silyl, bromomethyldimethylgermyl and the like; and disubstituted boron radicals including dimethylboron for example; and disubstituted pnictogen radicals including dimethylamine, dimethylphosphine, diphenylamine, methylphenylphosphine, chalcogen radicals including methoxy, ethoxy, propoxy, phenoxy, methylsulfide and ethylsulfide. Non-hydrogen substituents R include the atoms carbon, silicon, boron, aluminum, nitrogen, phosphorous, oxygen, tin, sulfur, germanium and the like, including olefins such as but not limited to olefinically unsaturated substituents including vinyl-terminated ligands, for example but-3-enyl, prop-2-enyl, hex-5-enyl and the like. Also, at least two R groups, preferably two adjacent R groups, are joined to form a ring structure

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having from 3 to 30 atoms selected from carbon, nitrogen, oxygen, phosphorous, silicon, germanium, aluminum, boron or a combination thereof. Also, a substituent group R group such as 1-butanyl may form a carbon sigma bond to the metal [M]  $\underline{M}'$ .

Other ligands may be bonded to the metal [M]  $\underline{M}'$ , such as at least one leaving group Q. In one embodiment, Q is a monoanionic labile ligand having a sigma-bond to [M]  $\underline{M}'$ . Depending on the oxidation state of the metal, the value for n is 0, 1 or 2 such that formula (III) above represents a neutral bulky ligand metallocene-type catalyst compound.

*At column 8, lines 14-44, please delete the paragraphs and insert the following:*

In one embodiment, the bulky ligand metallocene-type catalyst compounds of the invention include those of formula (III) where  $L^A$  and  $L^B$  are bridged to each other by at least one bridging group, A, such that the formula is represented by



These bridged compounds represented by formula (IV) are known as bridged, bulky ligand metallocene-type catalyst compounds.  $L^A$ ,  $L^B$ , [M]  $\underline{M}'$ , Q and n are as defined above. Non-limiting examples of bridging group A include bridging groups containing at least one Group 13 to 16 atom, often referred to as a divalent moiety such as but not limited to at least one of a carbon, oxygen, nitrogen, silicon, aluminum, boron, germanium and tin atom or a combination thereof. Preferably bridging group A contains a carbon, silicon or germanium atom, most preferably A contains at least one silicon atom or at least one carbon atom. The bridging group A may also contain substituent groups R as defined above including halogens and iron. Non-limiting examples of bridging group A may be represented by  $R'_2C$ ,  $R'_2Si$ ,  $R'_2Si R'_2Si$ ,  $R'_2Ge$ ,  $R'P$ , where  $R'$  is independently, a radical group which is hydride, hydrocarbyl, substituted hydrocarbyl, halocarbyl, substituted halocarbyl, hydrocarbyl-substituted organometalloid, halocarbyl-substituted organometalloid, disubstituted boron, disubstituted pnictogen, substituted chalcogen, or halogen or two or more  $R'$  may be joined to form a ring or ring system. In

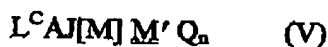
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one embodiment, the bridged, bulky ligand metallocene-type catalyst compounds of formula (IV) have two or more bridging groups A (EP 664 301 B1).

*At column 9 lines 9-25, please delete the paragraphs and insert the following paragraphs:*

In this embodiment, the bulky ligand metallocene-type catalyst compound is represented by the formula:



where  $[M] \underline{M}'$  is a Group 3 to 16 metal atom or a metal selected from the Group of actinides and lanthanides of the Periodic Table of Elements, preferably  $[M] \underline{M}'$  is a Group 4 to 12 transition metal, and more preferably  $[M] \underline{M}'$  is a Group 4, 5 or 6 transition metal, and most preferably  $[M] \underline{M}'$  is a Group 4 transition metal in any oxidation state, especially titanium;  $L^C$  is a substituted or unsubstituted bulky ligand bonded to  $[M] \underline{M}'$ ; J is bonded to  $[M] \underline{M}'$ ; A is bonded to  $[M] \underline{M}'$  and J; J is a heteroatom ancillary ligand; and A is a bridging group; Q is a univalent anionic ligand; and n is the integer 0, 1 or 2. In formula (V) above,  $L^C$ , A and J form a fused ring system. In an embodiment,  $L^C$  of formula (V) is as defined above for  $L^A$ , A,  $[M] \underline{M}'$  and Q of formula (IV) are as defined above in formula (III).

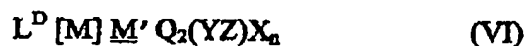
*At column 9, line 62, carried over to column 10, line 25, please delete the paragraphs and insert the following paragraphs:*

In a particularly preferred embodiment, the other metal compound or second metal compound is the bulky ligand metallocene-type catalyst compound is represented by the formula:

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where  $[M] \underline{M'}$  is a Group 3 to 16 metal, preferably a Group 4 to 12 transition metal, and most preferably a Group 4, 5 or 6 transition metal;  $L^D$  is a bulky ligand that is bonded to  $[M] \underline{M'}$ ; each Q is independently bonded to  $[M] \underline{M'}$  and  $Q_2(YZ)$  forms a ligand, preferably a uncharged polydentate ligand; A or Q is a univalent anionic ligand also bonded to  $[M] \underline{M'}$ ; X is a univalent anionic group when n is 2 or X is a divalent anionic group when n is 1; n is 1 or 2.

In formula (VI), L and  $[M] \underline{M'}$  are as defined above for formula (III). Q is as defined above for formula (III), preferably Q is selected from the group consisting of -O-, -NR-, -CR<sub>2</sub>- and -S-; Y is either C or Si; Z is selected from the group consisting of -OR, -NR<sub>2</sub>, -CR<sub>3</sub>, -SR, -SiR<sub>3</sub>, -PR<sub>2</sub>, -H, and substituted or unsubstituted aryl groups, with the proviso that when Q is -NR- then Z is selected from one of the group consisting of -OR, -NR<sub>2</sub>, -SR, -SiR<sub>3</sub>, -PR<sub>2</sub> and -H; R is selected from a group containing carbon, silicon, nitrogen, oxygen, and/or phosphorus, preferably where R is a hydrocarbon group containing from 1 to 20 carbon atoms, most preferably an alkyl, cycloalkyl, or an aryl group; n is an integer from 1 to 4, preferably 1 or 2; X is a univalent anionic group when n is 2 or X is a divalent anionic group when n is 1; preferably X is a carbamate, carboxylate, or other heteroallyl moiety described by the Q, Y and Z combination.